Government
Institute for
Economic Research

Working Papers 52

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Working Papers 52 | October 2013

VATT WORKING PAPERS

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Helsinki 2013

Acknowledgments: We are grateful to Essi Eerola, Seppo Kari and Mika Kortelainen as well as many seminar audiences for their helpful comments. We are also grateful for the financial support of the Nordic Tax Research Council for the data collection.

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ISBN 978-952-274-094-6 (PDF)

ISSN 1798-0291 (PDF)

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Arkadiankatu 7, 00100 Helsinki, Finland

Edita Prima Oy
Helsinki, October 2013

Cover design: Niilas Nordenswan

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Abstract

This paper provides causally plausible estimates of the effects of consumption taxes in a service sector on prices and demand for restaurant services. We utilize a large VAT reform affecting restaurant meals, where the VAT rate was cut from 22% to 13% in 2010 in Finland. By comparing with restaurants in neighboring countries and other related sectors in Finland, the reform offers a natural experimental approach. The results indicate that restaurants reduced their prices on average by only 2%, which equals roughly a quarter of the full pass-through. Remarkably, at the same time a majority of restaurants did not reduce their prices at all and a non-trivial fraction of restaurants reduced their prices by exactly the full pass-through. Larger restaurants reduced their prices more often than smaller restaurants. We do not observe any increases in the quantity of services sold or in wage sums paid to employees. Furthermore, there are no changes in medium-term entry and exit due to the reform.

Key words: VAT reform, restaurants, tax incidence

JEL classification numbers: H21, H22, H32

Tiivistelmä

Tässä tutkimuksessa arvioidaan kulutusverotuksen vaikutuksia työvaltaisten palvelualojen hintoihin, kysyntään ja työllisyyteen. Tutkimuksessa hyödynnetään ravintoloiden arvonlisäveroalennusta vuoden 2010 heinäkuussa, jolloin ravintoloissa tarjottujen ruoka-annosten verokanta laski 22 prosentista 13 prosenttiin Suomessa. Ravintola-alaa vertaillaan hotelleihin Suomessa ja ravintoloihin naapurimaissa. Tulosten perusteella arvonlisäveroalennus laski kuluttajahintoja keskimäärin noin 2 prosenttia. Jos veromuutos olisi alentanut kuluttajahintoja täysimääräisesti, lasku olisi ollut 7,4 prosenttia. Keskimääräinen hintavaikutus oli siis vain noin neljäsosa täydestä hintavaikutuksesta. Liike-vaihdolla painotettu keskimääräinen hintavaikutus oli suurempi, mutta kuitenkin reilusti alhaisempi kuin täysi hintavaikutus. Suurempi painotettu hintavaikutus tarkoittaa sitä, että suuremmat ravintolat laskivat kuluttajahintojaan keskimäärin

enemmän kuin pienemmät ravintolat. Tulokset osoittavat myös, että hyvin monet ravintolat eivät laskeneet hintojaan lainkaan veromuutoksen jälkeen ja useat ravintolat, jotka muuttivat hintoja, alensivat niitä tarkalleen 7,4 prosentilla. Ravintola-annosten myyntimäärässä ei havaita kasvua veromuutoksen jälkeen, joten ravintolapalveluiden kysyntä vaikuttaa olevan hyvin jäykkää. Lisäksi tulosten perusteella voidaan päätellä, että myöskään työllisyys alalla ei kasvanut. Johtopäätöksenä voi siis todeta, että arvonlisäverokantojen alennukset työvaltaisille palvelualoille eivät ole tehokas keino lisäämään taloudellista aktiivisuutta.

Asiasanat: ALV-alennus, ravintolat, verokohtaanto

JEL-luokittelu: H21, H22, H32

1 Introduction

Internationally, the share of consumption taxes of total tax revenue seems to be increasing all the time. Governments have also tried to support specific sectors through reduced consumption tax rates aiming to create jobs in these sectors. Despite the vast theory literature[1], there is only a narrow empirical literature credibly examining the effects of consumption taxes on prices and quantities (Carbonnier (2007), Doyle and Samphantharak (2008), Kosonen (2010), Marion and Muehlegger (2011)). Many studies focus solely on price incidence. However, price responses are not sufficient statistics for more thorough efficiency analysis. It is more important to know the demand elasticity of a good or service.

This study aims to produce policy-relevant statistics on the efficiency of consumption taxation by analyzing a value added tax (VAT) reform affecting restaurants in Finland. The VAT for restaurant meals was cut from the standard rate of 22% to the reduced rate of 13% in July 2010. We utilize this policy change to investigate the effects of consumption taxes on prices, demand for restaurant services and wage sums paid to employees. The results offer insights into the effectiveness of consumption taxes in labor-intensive sectors.

We apply a difference-in-differences (DD) approach. Restaurant meals in Finland in the treatment group are compared against multiple control groups. This improves the robustness of the results. The control groups are hotel services in Finland, and restaurant meals in Estonia, Norway and Sweden. In the demand and wage sum estimations we use only hotels in Finland as a comparison group due to data limitations.

The identifying assumption in the DD approach is that a control group should behave similarly to a treatment group without facing a treatment. In the current setting this assumption is likely to be fulfilled, since we compare the same sectors in neighboring countries with a similar climate and culture. Moreover, hotels and restaurants are closely related sectors and resemble each other. Empirical support for the assumption that these groups resemble each other is provided by the similar long-term development of restaurant meal prices in the countries we compare, and in turnover and wage sum development in the two sectors we compare. The reform is exogenous to the behavior of firms, since it was made possible by European Union-level rules

[1] E.g. Ramsey (1927), Atkinson and Stiglitz (1976), Myles (1989).

shortly before the Finnish VAT cut. It also seems that restaurants did not anticipate the VAT cut by altering their prices prior to the reform.

Our price data come from a self-designed survey. The survey is for a random sample of restaurants and hotels in Finland and restaurants in Estonia. Prices were collected from the websites of the firms in the sample, or if this was not possible, by phone. The data includes the price of the same meal in the same restaurant and the price of the same room in the same hotel before and after the reform. Thus the price information allows us to follow the development of prices of individual services. By looking at the relative change of all services, we are able to describe the whole distribution of price changes, rarely possible in the previous literature. In addition, we estimate the average price response with meal-level fixed-effects, which gives us high precision. The survey contains information about interesting predetermined characteristics of firms, allowing us to divide the results by them. For robustness we use restaurant meal price data from Norway and Sweden originating from data collected for the construction of consumer price indices.

Additional interest in this paper lies in the impact of the reform on the demand for restaurant services and wage sums. For this we have a monthly and annual level tax register data. On monthly level we have information about turnover, which is the consumer price value of services sold, and the wage sums of each firm. Comparing the development of prices and turnover of the same firms in the treatment and control groups over the reform period allows to estimate the impact of the reform on the quantities of services sold. The development of wage bills in the two groups over the reform period gives an indication of whether there are any changes in employment due to the reform. In addition, we examine entry into and exit out of the restaurant industry.

Our unweighted average result shows that the VAT cut from 22% to 13% reduced restaurant prices by 2.2% in Finland. Full pass-through to consumer prices would imply a 7.4% decrease. Thus the result implies that the actual price reduction was only a fourth of the full pass-through. The consumer-weighted price response was somewhat larger, a 4% decrease in consumer prices, or over half of the full pass-through. This implies that larger restaurants reduced their prices more than small restaurants. There is a substantial heterogeneity in price responses by restaurant type. However, the estimation results suggest no increase in demand for restaurant services or employment in the restaurant industry. Furthermore, we do not find any effects on entry into or exit out of the restaurant industry due to the reform.

Our results contribute to a narrow literature estimating the effects of consumption taxes. Many studies in the previous literature concentrate on industries with only few producers and industries where large companies dominate the market. We concentrate instead on the restaurant industry, which contains very heterogeneous firms and is a labor-intensive industry. Also, the number of studies that have produced results on the quantity of services sold or wage sums is fairly limited. By linking our unique price and tax register data, we have an opportunity to estimate these margins as well, and be more conclusive about the effectiveness of consumption taxes.

Doyle and Samphantharak (2008) estimated the tax incidence on gasoline prices in certain states in the USA from a temporary repeal and reinstatement of a gasoline consumption tax. They found almost 100% pass-through on prices. Marion and Muehlegger (2011) found similar estimates for fuel prices. Carbonnier (2007) found lower pass-through for a car retailer industry than for a repair service industry when he analyzed two separate VAT rate reductions in France. He interpreted this to be a result of differences in the degree of competition in these industries. Kosonen (2010) found that the pass-through on prices was half of the full pass-through for the hairdressing service industry, after a VAT reduction in Finland. Kosonen also studied the demand for hairdressing services and employment. He concluded that the demand for these services seems to be rather inelastic. Hairdressers and restaurants resemble each other since both are labor-intensive service sectors. Therefore it is not surprising that our results are very much in line with that study.

The paper proceeds as follows. Section 2 presents the institutional background and economic theory predictions as a result of the VAT reduction. Section 3 presents the methods used in the study, section 4 describes the data and section 5 presents the results. Finally, section 6 concludes the study.

2 Institutions and predictions

2.1 Value-added taxation in the EU

The European Union obligates all Member States to apply value-added taxation as a consumption tax system. Since 1977 the EU has applied uniform VAT coverage under the Sixth VAT Directive. The new VAT Directive replaced it in 2007 (CD 2006/112/EC). The Directive states that Member

States can have one standard VAT rate between 15% and 25% and at most two reduced rates of at least 5%[2]. In Finland the standard VAT rate is levied on most goods and is currently 24%. There are two reduced VAT rates in Finland. The higher of these two, 14%, is levied on e.g. restaurant meal sales. The lowest VAT rate, 10%, is levied on books, accommodation services, pharmaceuticals etc.[3]

The Council of the EU introduced the possibility of applying a reduced VAT rate on labor-intensive services already in 1999 (CD 1999/85/EC). Although reduced VAT rates for certain labor-intensive industries were possible from 1999 onwards, such rates were not available for restaurants until May 2009 (CD 2009/47/EC). Thus, prior to 2009, restaurant services were subject to the standard VAT rate in all EU Member States. France was the first to apply a reduced rate for restaurant services. In July 2009, the VAT rate was cut from 19.6% to 5.5% (OECD (2010)). Despite the substantial reduction in the VAT rate, prices only fell by 1.4% after the reform (MEIE (2010)).

This paper examines the effects of the reform which took place in Finland at the beginning of July 2010 (HE 137/2009) when the VAT rate for restaurant services was reduced from 22% to 13%. At the same time the Finnish government decided to increase all VAT rates by 1 percentage point.

2.2 Tax shifting and optimal consumption tax

Let us first consider the tax incidence of the VAT rate on consumer prices. A change in the VAT rate can shift to consumer prices by varying degrees. Under perfect competition, the price incidence depends on the elasticities of demand and supply. For instance, if demand is fairly inelastic and supply very elastic, there would be close to full pass-through to consumer prices. In general, the pass-through to prices increases with supply elasticity and decreases with the demand elasticity.

When the number of firms is limited and/or there is strategic interaction between the firms (imperfect competition), consumption taxes could under- or over-shift to consumer prices. The elasticities of demand and supply also

[2]There are some exceptions from the lowest tax rates, e.g. zero rates on books in the United Kingdom. Some sectors are also exempted from VAT, e.g. postal services.

[3]Recently there have been two increases in VAT rates in Finland. Before July 2010 the VAT rates were: 22%, 12% and 8%. After July 2010 all three VAT rates were increased by 1 percentage point. Again from the beginning of 2013 all VAT rates increased by 1 percentage point. Thus the VAT rates are currently: 24%, 14% and 10%.

affect the pass-through in an imperfect competition model. Additionally, in an imperfect competition model, the shape of the demand curve relative to the perfect competition prediction affects the pass-through. With a concave demand curve, the tax under-shifts to prices but with a convex demand curve over- shifts to prices (Myles (1989), Weyl and Fabinger (2013)).

We study the price incidence with a reduction in the VAT rate for restaurant services from 22% to 13%. The data include prices for the same meal offered in the same restaurants before and after the reform. Thus, as we analyze the price effects, we can identify the proportional change in consumer prices for each meal in the following way:

$$\Delta = \frac{p^a - p^b}{p^b} * 100 = x\% \tag{2.1}$$

$$\phi * 1.22 = p^b \blacktriangleright \phi * 1.13 = p^a$$

where p^a is the consumer price after the reform and p^b is the consumer price before the reform. The consumer price is the producer price ϕ plus the VAT. When there is 100% pass-through, the producer price does not change. Thus the full pass-through is:

$$\frac{\phi(1.13 - 1.22)}{\phi 1.22} * 100 = -7.38\%$$

A couple of remarks should be made. First, the quality of the meals could change due to the reform. The quality of meals could perhaps increase as the costs of producing them decrease, if there are no changes in prices. But if the quality of meals increases due to the reform, the restaurants are likely also rename the meals as well, and this would not be problem for us. On the other hand, the quality of meals could decrease in those restaurants that lower their prices. Even where the price decreases and the quality of the product decreases, price changes when applying the above equation would give us an upper bound for the pass-through. However, it is important to note that the price data we have, concerns meals offered by restaurants exactly with the same name before and after the reform. Thus, we assume that the quality does not change if the name of the meal does not change.

Second, we are not able to observe cross-price effects on other goods or services. A restaurant meal can be a substitute or a complement for other goods or services affecting the amount of consumption or prices of these

other goods due to the reform for meals. For example, lunch meals during the working day can be a substitute for lunch boxes or take-away meals from a restaurant. On the other hand, a restaurant meal can be complementary to hotel services, especially during holiday seasons. Despite these problems, restaurant meals represent only a small proportion of the whole consumption budget (3.6% in 2006) and thus the effects due to substitutability or complementarity should be small.

In order to design an optimal consumption tax system, a perfectly competitive model result implies that the consumption tax rates of a good or a service should vary according to the elasticity of its own demand, the elasticity of supply and the cross-price effects on other goods. In the case of fairly inelastic demand, a good should face a higher tax rate than a good with elastic demand, if cross-price effects between taxed goods are zero. The reason is that an increase in the tax rate of an inelastic good would have only little effect on demand for the good and thus lead to only small distortions in the demand for that good (Ramsey (1927), Diamond and Mirrlees (1971)). However, cross-price effects could be high if there are close complements or substitutes for a taxed good.

The literature presents another argument for efficient consumption taxation. This concerns the distortions created by labor taxation on labor supply (Atkinson and Stiglitz (1976)). These distortions could be diminished by using consumption taxation. The result is that these distortions diminish if the consumption of goods or services highly complementary with work are taxed less, and vice versa. Clearly this suggests setting lower tax rates for goods and services that are closely related to work and labor, and tax more the consumption of goods that are related to leisure. We do not analyse this argument in this paper. This is because the complementarity of a restaurant meal with labor supply is not clear. It is complementary with work if we consider lunches during the working day. On the other hand, a restaurant meal is complementary with leisure in terms of enjoying meals one's spare time, e.g. fine dining. Moreover, restaurant services represent only a small fraction of the total consumption basket of an average individual (3.6% in 2006 in Finland[4]). Thus changes in taxation for this small share of one's consumption are not likely to greatly affect the substitutability of labor.

We assess the efficiency of the consumption tax system for restaurant services by examining the effect of the VAT cut on the quantity of restaurant

[4]Statistics Finland: Household Budget Survey (2009).

meals sold and wage sums paid to employees. The best case scenario to evaluate the demand for a good would be to be able to observe the price of a good and the amount of the good sold by the firm. The second best case is to observe prices and the total sales of the firm. This is what we have in our data set, including prices and the reported value of turnover in consumer prices.

Assume for now that the whole turnover consists of sold restaurant meals. Then turnover is simply the quantity of restaurant meals sold times the consumer price. With this variable we estimate the changes in demand (quantity) due to the VAT reform. If there are no changes in consumer price and quantity, turnover would remain the same over time, before and after the reform. However, if the consumer price decreases due to the VAT rate reduction and quantity remains the same, turnover decreases by the amount of the price decrease. If the consumer price decreases and the quantity sold increases relatively more than the price decreases, turnover would increase. We observe the consumer prices for restaurant meals and the monthly level consumer price value of total sales in the data before and after the VAT reduction. Thus we have an opportunity to investigate the changes in the quantity of meals sold for each restaurant and interpret how demand changed due to the reform.

We also estimate the effects of the VAT reduction on wage sums. The costs of producing restaurant meals decreased due to the VAT reduction. This could increase the wage payments of a restaurant to its employees and/or increase the number of employees working in a restaurant. The wage sums of restaurants would then increase due to the reform if restaurants hire more workforce and/or pay more wages to their current workers after the reform.

3 Methods

This section describes the methods. Because of the exceptional data sets, we make extensive use of graphical analysis to examine the effects of the reform in this paper. We also use a natural experimental method to investigate the average effect of the reform on prices, turnover and wage sums. We apply a difference-in-difference (DD) approach and thus compare the outcomes between the treatment and control groups over time.

We have a unique possibility to perform graphical analysis with our price data. We show the whole distribution of relative price changes, applying

the equation (2.1), as we follow the prices of the same product or service before and after the reform. Graphical evidence shows explicitly the whole range of price changes and thus is more informative than, for example, a standard mean regression of the change in prices. In our graphical analysis the proportional price changes in Finnish restaurants are compared to price changes in Estonian restaurants and hotel room price changes in Finland. We also perform comparisons within the restaurant industry using different categorical variables.

We also use a standard DD method with meal fixed-effects to estimate the average effect of the reform on meal prices. The simplest set-up of the DD method is when outcomes are observed for two separate groups for two different time periods. The standard way to describe the DD method is to present the following equation:

$$P_{it} = \eta_i + \beta_1 1(Treat)_i + \beta_2 1(After)_t + \beta_3 1(Treat_i * After_t) + \beta_4 (X_{it}) + \varepsilon_{it} \tag{3.1}$$

where the dependent variable P represents the logarithmic meal price of firm i at time t, the constant η_i is the estimated fixed effect for every meal, *1(Treat)* is an indicator variable with the value one for treated and zero otherwise, *1(After)* is also an indicator variable with the value one after the reform and zero otherwise, and *1(Treatment*After)* represents the interaction variable of these two variables. The coefficient of this interaction term identifies the effect of the reform on outcome P. X contains a vector of firm-level control variables and ε is the i.i.d. error term.

As a result of the fixed-effects estimation, β_3 represents the average proportional change in meal prices as a result of the reform. We are able to perform a meal-level fixed-effects estimate because we followed the prices of the same meals in the same restaurants over time, before and after the reform. This gives us a very precise price estimate.

The main identifying assumption in the DD approach is the parallel time trends. Thus the time effects should behave similarly in both groups before the reform. The difference between the groups is that one of the groups is exposed to a treatment and the other is not. The treatment group consists of Finnish restaurants which experienced the VAT reduction. We use many separate control groups to show the robustness of the results. In our main price analysis we use restaurant meal prices in Estonia to formulate the control group. We also use Swedish and Norwegian Consumer Price Index

(CPI) data for restaurants and Finnish hotel room prices to represent control groups.

One concern might be that restaurants in these countries are not suitable comparison groups for restaurants in Finland. However, there are a number of reasons to believe that the assumption holds in this case. All the countries are neighboring countries to Finland and, for example, face similar weather conditions, vacation periods, global food prices, business cycles, culture etc. We have no reason to believe that e.g. Finnish and Estonian restaurants would behave differently from each other during our short examination period without an exogenous shock in Finland. Restaurants in Estonia could experience different conditions in the long run, e.g. in the competitive environment, but we do not consider this to be a problem over our relatively short examination period (3 months). In addition, we can test the robustness of the results by comparing the prices of Finnish restaurants to restaurant meal prices from the statistics offices in Norway and Sweden, which are collected for CPI purposes. We believe that all these control groups constitute good counterfactuals for the treatment group.

In order to give further credibility to our approach, we use another control group from Finland, namely hotels, which operate in an industry similar to restaurants, but which did not experience the VAT cut. The VAT applied to hotel services was already at the lowest reduced rate of 9% before the reform in Finland. Hotels are used as a comparison group when we study price effects, but more importantly, we apply hotels as a control group when we are interested in the effects on quantity of meals sold and wage sums. We are forced to do this because of the lack of tax register data from the restaurants in neighboring countries. There might be problems in the analysis when comparing restaurants to hotels. Hotels can, for example, have more flexible or organized pricing strategies and face more concentrated demand for their services within the calendar year than restaurants. More importantly, hotels might have been affected by the reform as many hotels also offer restaurant services. Also, there might be cross-price effects between meals and hotel room prices. However, despite of all these problems and the lack of any other relevant control group, we compare these industries and try to convince that the comparison is plausible. To offer evidence favoring the comparison, we find a similar trend in turnover and wage sums over time for hotels and restaurants (see Figure 9). Thus hotels seem to comprise a relatively good control group for restaurants. However, the monthly variation in demand for hotel services is more pronounced during summer period than for restaurant

services and this could still cause challenges for our analysis.

We apply the same DD method, described in equation 3.1, when we examine the demand and employment effects of the reform. The measure applied for demand is the monthly turnover of the firms valued at consumer prices and for employment the measure is the monthly wage sums paid to employees. In these estimations we use Finnish restaurants in the treatment group and Finnish hotels in the control groups because we lack tax register data from neighboring countries.

One possible problem in using DD method could be that the policy change is not exogenous or the firms in the treatment group anticipated the reform by changing their behavior before the actual policy change. The Finnish government allowed the restaurant industry, and not other industries, to apply a reduced VAT rate since the EU Directive permitted them to do so. Thus, the reform was not solely dependent on the economic conditions in the restaurant industry, rather it was an attempt to revive the economy overall. Also, in figure 1 we show that we do not find any empirical evidence to support anticipation behavior among restaurants. Therefore, we believe that it is possible to use the standard DD method to examine the causal effects of the reform on restaurant meal prices, demand for restaurant services and wage sums paid to employees. However, because of the short examination period available we concentrate only on the short-run changes.

One challenge in our empirical set-up is to present appropriate standard errors for the estimates. Two previous papers by Bertrand *et al.* (2004) and Cameron *et al.* (2008) emphasise this problem. The problem arises when the number of groups used in the estimations is small. It could be, for example, that there is an unobserved shock affecting the groups' behavior differently and thus biasing the standard errors. Fortunately, the two papers mentioned above offer us tools to overcome this problem. Following the guidelines of these papers, we apply a block bootstrap strategy to calculate the standard errors. We use two sets of clusters. First, we apply country-level clusters in the price estimations. Second, when we compare Finnish restaurants to Finnish hotels we use industry-level clusters in the price, quantity and employment estimations. The strategy of calculating standard errors does not affect the significance of results too much as, at most, it doubles the standard errors of the main price estimates with no clustering. However, for the weighted price results block bootstrapping is not possible. Then we only apply heteroscedasticity-consistent standard errors and the significance of these results should be interpreted with caution.

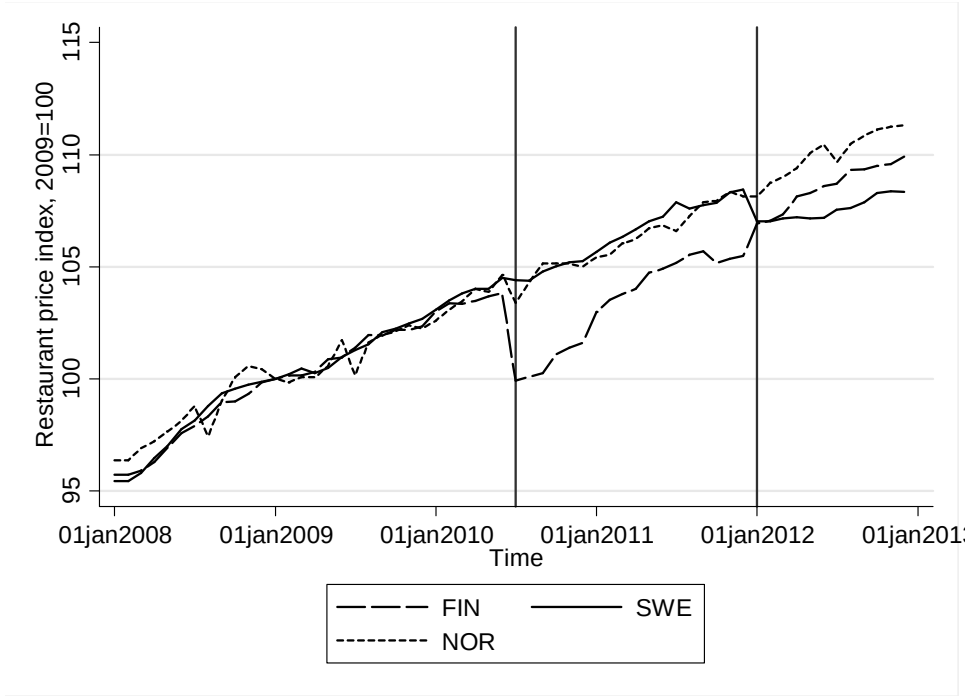

Figure 1: Longer-term development of restaurant prices in Finland, Sweden and Norway

4 Data

We have price data from a price collection survey which was conducted on the basis of a random sample of restaurants and hotels from the Tax Administration data including all firms liable for VAT in Finland. We designed our own survey method to collect prices. We were able to collect prices from approximately 750 restaurants in Finland before and after the reform. The data include many categorical variables which we can use to divide prices, e.g. belonging to a chain, restaurant type, etc.

We took a random sample just before the reform in March 2010 from both the restaurant and hotel industries. The sample is representative of all restaurants and hotels in Finland. The price collection was made before and after the reform, i.e. in May/June 2010 and July/August 2010. The survey was also conducted in Estonia, where the VAT rate on restaurant meals did not change during the collection period. The sample of Estonian restaurants

was also a random sample from the Estonian tax register data.[5]

In the collection method, we mainly collected prices from the internet. If this was not possible via the internet we collected the prices by phone. The collection followed a questionnaire where the restaurants were divided into four categories by restaurant type.[6] Each category had its own questionnaire with a minimum of 7 prices and a maximum of 11 prices. In each round of surveys (before and after) we recorded the price of the same product from each firm. Also, the price collectors used exactly the same collection questionnaires and methods in both countries, which is very important for our analysis. In addition, the price collection for hotels followed the same principles than the survey for restaurants. Hotel prices refer to hotel room prices. Table 1 presents descriptive statistics of the price data in euros. On average, meal prices seem to be lower in Estonia than in Finland but this is not a substantial problem as we are interested in the price changes over a short period of time.[7]

	Finland			Estonia		
Variable	Mean	SD	N	Mean	SD	N
Main Meal	10.68	7.10	1452	6.51	3.97	746
Other Meal	9.97	5.89	1146	6.35	3.67	748
Vege Meal	8.94	4.64	900	3.72	2.02	674
Pizza	7.71	2.27	704	2.97	1.60	226
Appetizer	4.81	2.90	678	3.34	2.50	542
Lunch	8.30	2.69	464	3.12	1.85	266
Wine	8.70	11.44	204	3.98	6.64	220
Beer	4.44	.97	194	2.36	.71	320
Hotel price	156.38	246.67	518			

Table 1: Price data: Continuous variables

We also collected various firm-level categorical variables. The location of the firm (Finland/Estonia), the method of collection (phone/internet), belonging to a chain and belonging to a lobbying union representing restaurants

[5]We also use CPI data sets for restaurant meal prices in Sweden and Norway as comparison groups in our price-response analysis.

[6]The restaurant types are a la carte, fast food, cafeteria and lunch restaurants.

[7]Table A1 in the Appendix shows the descriptive statistics for CPI data from the statistics offices in Sweden and Norway.

and hotels in Finland (MaRa)[8] are the most important categorical variables in the analysis. In our study, a firm is considered to being a chain if there is more than one restaurant with same name or firm identifier. We also categorize franchising firms as chains. MaRa, instead, represents the leading national trade and labor market association in the hospitality industry in Finland, including e.g. both restaurants and hotels. MaRa members produce over 80% of all turnover in the sector. Table 2 describes the statistics of these variables (in euros). Most of the prices are from the internet, almost nine out of ten prices in Estonia were collected from the web, whereas in Finland a quarter of the prices were collected by phone. It also seems that there are more restaurants belonging to a chain Finland than in Estonia.

	Finland			Estonia		
Variable	Share	SD	N of firms	Share	SD	N of firms
Internet	.72	.45	1345	.89	.32	712
Phone	.28	.45	523	.11	.32	88
Chain	.32	.47	598	.15	.36	120
MaRa	.31	.46	572			

Table 2: Price data: Categorical variables

The histogram in Figure 2 compares the mean of three meal prices between Finnish and Estonian restaurants. It seems that the distribution of restaurant meal prices is relatively similar in Finland and in Estonia. However, the variation in prices seems to be larger in Finland and there is more weight on the right-hand side of the distribution in Finland than in Estonia. Nevertheless, the shapes of the distributions are similar, and thus we are able to compare Finnish prices with Estonian prices.

The second data set is from the Finnish Tax Administration and include all firms liable for VAT in Finland. A firm is liable with register to the tax authority if its turnover for the accounting period (12 months) is over 8,500 euros. The data contain important monthly-level information about the firms' activities including turnover and the wage sums paid by the firms. Table 3 shows the pre-reform descriptive statistics of turnover and wage sums per month for Finnish restaurants and hotels. It seems obvious that

[8]Officially, the name of the association is the Finnish Hospitality Association (in Finnish, Matkailu- ja Ravintolapalvelut MaRa).

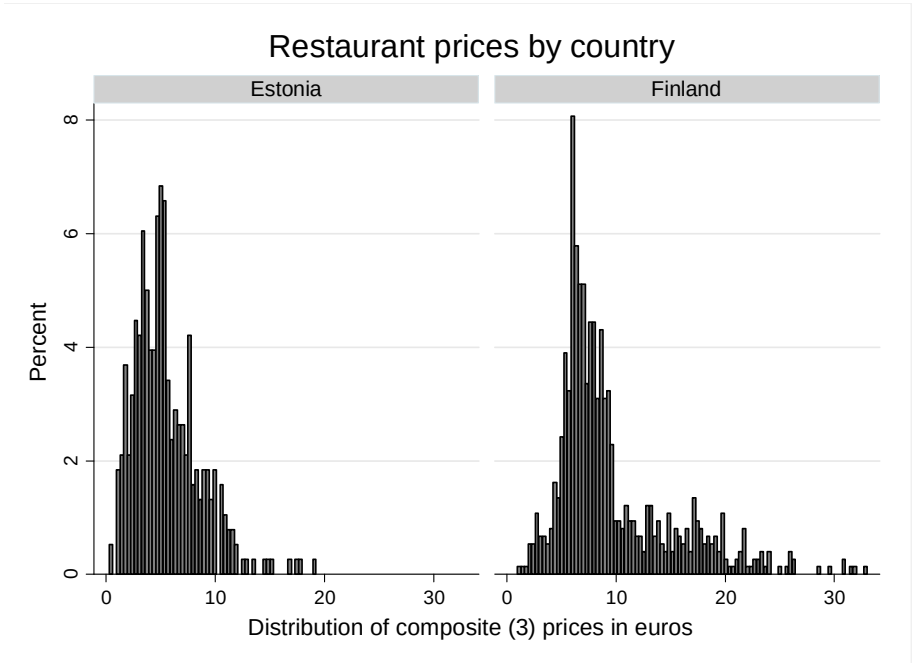

Figure 2: Histogram of the mean of three meal prices in Estonia and Finland

hotels are larger than restaurants, on average. We also have an extensive set of yearly-level tax record data which we can employ as controls in our estimations.

	Restaurants		Hotels	
	Turnover	Wage sum	Turnover	Wage sum
Mean	38,166	12,430	82,090	33,804
Median	14,861	4,876	8,048	11,108
SD	373,656	57,116	360,798	90,372
N	11,343	11,343	1,245	1,245

Table 3: Descriptive statistics for monthly pre-reform turnover and wage sums of Finnish restaurants and hotels

Figure 3 shows the average monthly turnover of restaurants taxed at different VAT rates over time from the beginning of 2008 to the end of 2011. The standard VAT rate, 23% after July 2010, and two reduced VAT rates,

13% and 9% after July 2010, are levied on different goods[9]. The Figure clearly shows the VAT reform for restaurants in July 2010, marked with a solid vertical line, as the turnover reported in the second lowest VAT rate increases considerably and at the same time turnover in the standard VAT rate decreases. The reported turnover decreases by approximately 15,000 euros at the standard VAT rate and increases by a similar amount at the reduced rate. We consider this to represent the share of turnover in restaurants from meal sales, on average. Thus less than half of the turnover of restaurants comes from sales of meals (including non-alcoholic beverages)[10], the remainder coming from selling alcohol, drinks, etc. which are not taxed at the reduced VAT rate. Sales at the lowest VAT rate seem to be irrelevant for restaurants over time.

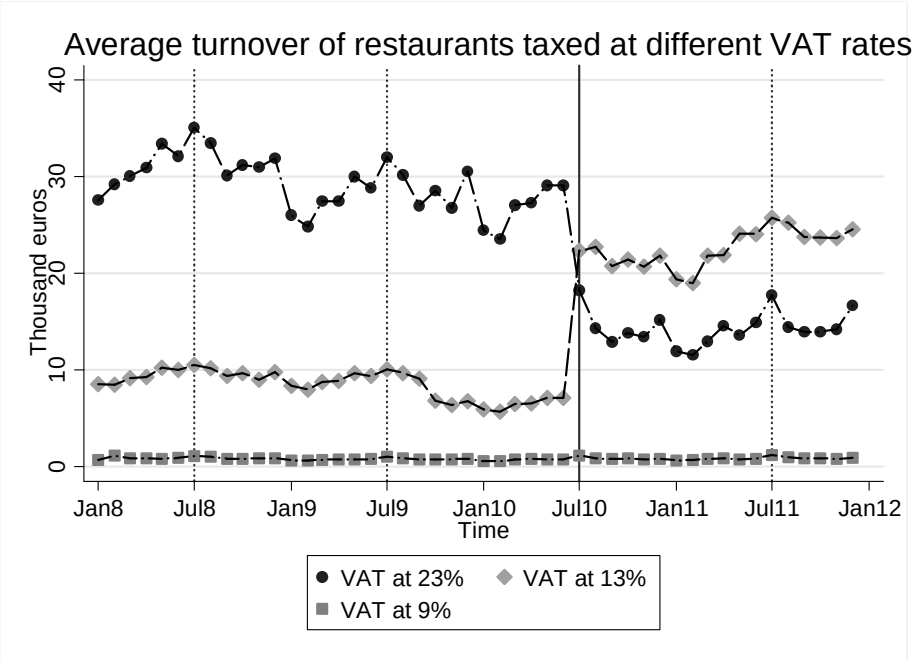

Figure 3: Average turnover of restaurants taxed at different VAT rates over time

[9]Before July 2010 all three VAT rates were 1 percentage point lower. From the beginning of 2013 the VAT rates have been 24%, 14% and 10%.

[10]Take-away meals were already at the lower VAT rate of 12% before the reform of July 2010.

5 Results

5.1 Price Effects

In our main price analysis we formulate a composite of the average of three main meal prices for each restaurant before and after the reform.[11] Therefore, the following graphical analysis of relative changes in consumer prices shows the changes in this variable. We construct this composite meal in order to avoid being overly dependent on the changes in individual meal price. By constructing a composite meal we can examine the entire change in a restaurant menu more precisely. However, we also offer the average price change results for each individual price.

We use equation (2.1) to calculate the relative price change for each firm. The relative price change denotes the percentage change in the price after the reform compared to the price level before the reform. Thus we can show the whole distribution of price changes, which gives very explicit evidence of how prices have changed.

Figure 4 presents the relative price changes as a composite in Finland and Estonia. Similarly, Figure 5 shows the distribution of relative price changes in composite prices of restaurant meals and hotel rooms in Finland. The vertical line represents the location of full pass-through in both graphs, which is -7.4%. A substantial proportion of restaurants did not change their prices at all in Finland, the zero relative change in the Figure. This indicates that over half of the whole sample of restaurants did not change their prices as a result of the VAT cut. However, there is a distinctive peak at the level of full pass-through. These restaurants shifted the entire tax change to their prices. We do not observe much change in hotel prices in Finland or restaurant prices in Estonia.

Next we divide the relative price change figures for restaurants by firm-level characteristics. These divisions describe the relative price changes among Finnish restaurants very precisely. In Figure 6 we divide the data by whether or not a restaurant belongs to a chain. The Figure shows that restaurants belonging to a chain changed their prices more often after the VAT cut than those not belonging to a chain. Notice also that chain status divides the sample very clearly into those that changed their prices and those that did not. Only 25% of all chain restaurants did not change their

[11] If we have less than three meal prices for an individual restaurant, we use only one or two prices as a composite meal.

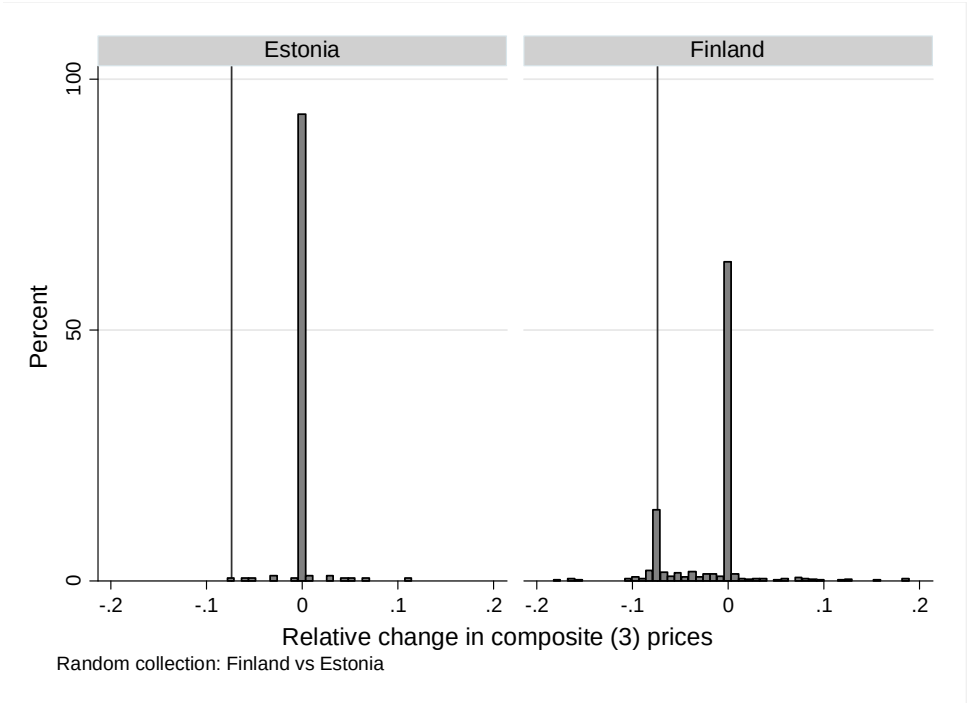

Figure 4: Distribution of relative price changes in Finnish and Estonian restaurants

prices and 40% responded with full pass-through. Almost all of the rest also decreased their prices and we observe only few price increases among chains. This suggests that the more organized restaurants changed their price more. They may operate in a more competitive environment, which may have forced them to reduce their prices more due to the VAT reform. Also, they might have more centralised price setting strategies than independent restaurants that are not part of a chain. It is also remarkable that restaurants not belonging to a chain have almost an equal amount of both price decreases and increases. Also, for them, there is no clear peak at the level of full pass-through.

In Figure 7, we divide the data into those restaurants that belong to MaRa and to those that do not. The figure evidently shows that these lobbying union members reduced their prices more often than others. Figures 6 and 7 are very similar because many of the chains also belong to MaRa. However, Figure 7 also shows a small peak at the level of full pass-through

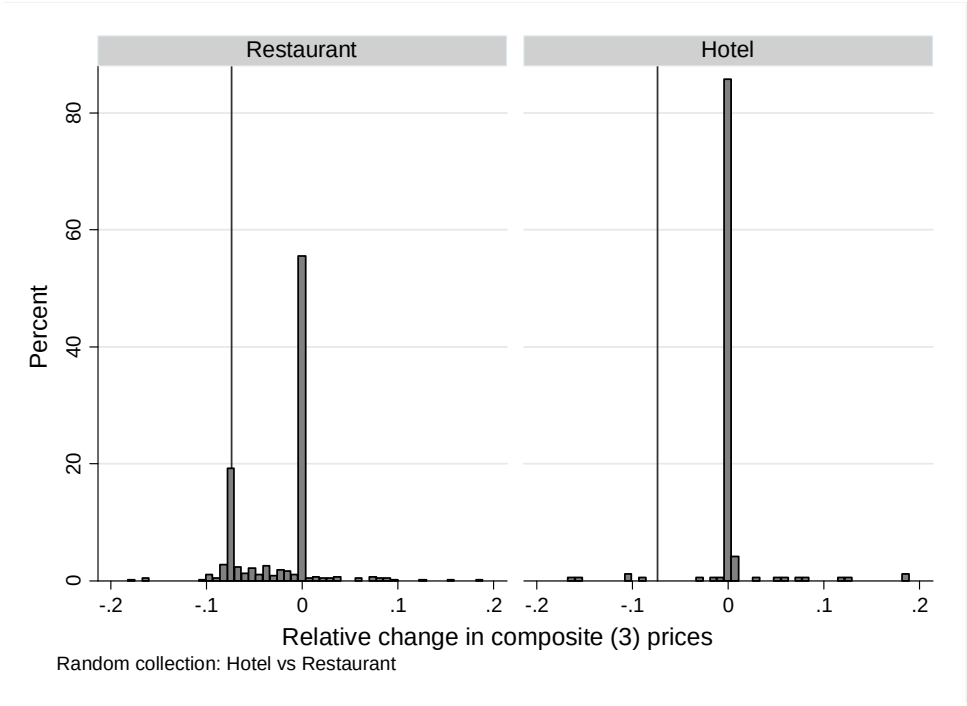

Figure 5: Distribution of relative price changes in Finnish restaurants and hotels

for restaurants not belonging to MaRa. Furthermore, this suggests a similar interpretation as we found for chain restaurants: more organized restaurants had larger price responses to the reform than independent restaurants.

We employ a natural experimental method to estimate the average price effects of the VAT reform. The dependent variable is the log of composite price, including 3 prices from the same restaurant before and after the reform. All estimates are differences-in-differences (DD) results comparing Finnish restaurant prices in the treatment group with several control groups over time.

Table 4 presents the average estimates of the effect of the VAT reform on prices. The table shows comparisons of Finnish restaurant prices with Estonian restaurant prices in columns (1) to (3), Finnish hotel room prices in column (4), Swedish restaurant prices in column (5) and Norwegian restaurant prices in column (6). Column (1) presents the DD results controlling for covariates and columns from (2) to (6) present the fixed-effects results.

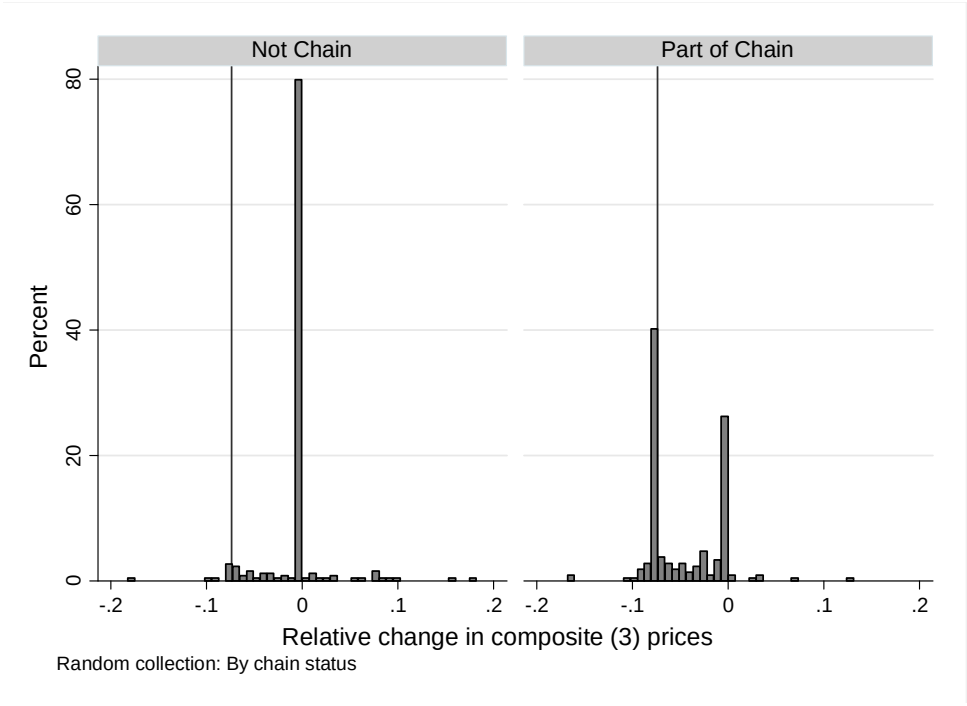

Figure 6: Distribution of relative price changes according to restaurants belonging to a chain and those not belonging to a chain

Our main result in column (2) indicates that unweighted meal prices in Finnish restaurants fell by 2.2% as a result of the VAT reduction when we compare them to Estonian meal prices. The response in column (3) is a bit larger, a 2.8% decrease in lunch prices. This suggests that lunch prices are a bit more responsive to the tax reduction. However, the response is not statistically different from the main estimate. When comparing with hotel prices, in column (4), meal prices seem to decline even more: 4.4%. This results is somewhat dependent on few price observations and overall the variation in hotel room prices is much larger than in meal prices. A comparison with Swedish meal prices from the CPI data shows that the average response is only a 1.2% decrease in consumer prices. However, the CPI data from Sweden includes only a very small number of observations for restaurant meals, see Table A1 in the Appendix. The price decrease is a bit larger than our main estimate as we use Norwegian restaurant meal prices as a comparison group, in column (6).

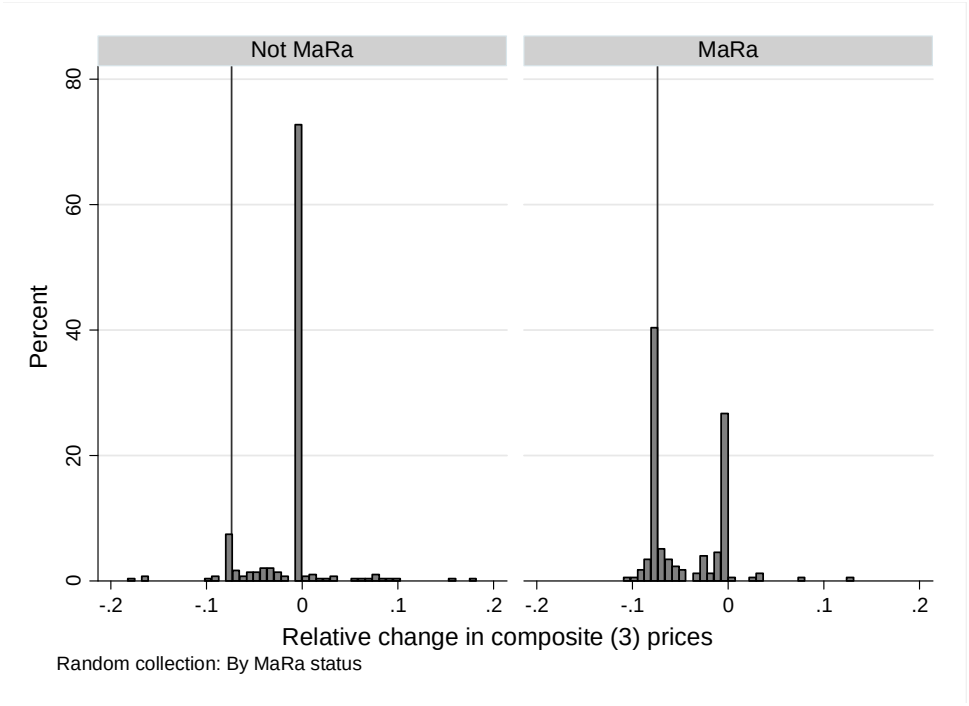

Figure 7: Histogram of relative price changes according to whether restaurants belong to MaRa or not

We present the weighted fixed effect results in Table 5. The weighted results aim at measuring the price change for a representative consumer. With this weighting we also take into account the heterogeneity in restaurant sizes. We use turnover statistics for 2010 to construct the weights. In practice we construct a categorical variable of 10 size groups to weight the results. We do this because the CPI data for Swedish and Norwegian restaurants contain only this kind of categorical variable without information about the exact numerical value of yearly turnover.

The dependent variable is again the log of composite price. Column (1) in Table 5 shows again the main unweighted result, column (2) presents the main weighted estimate, column (3) shows estimates comparing Finnish restaurants with hotels. Columns (4) and (5) compare Finnish restaurant meal prices with Swedish and Norwegian meal prices. The tax incidence on prices because of the VAT reduction varies from a 2.4% to 5.9% decrease in prices, depending on the comparison group.

	(1)	(2)	(3)	(4)	(5)	(6)
	Composite	Composite	Lunch	Composite	Composite	Composite
Control	Est	Est	Est	Hotels	Swe	Nor
DD	-0.022**	-0.022**	-0.028**	-0.044**	-0.012	-0.031**
	(0.011)	(0.010)	(0.012)	(0.022)	(0.009)	(0.016)
Specification	OLS	FE	FE	FE	FE	FE
N	2250	2250	1162	2020	1270	2155
R^2	0.200	0.153	0.128	0.081	0.163	0.088
N of firms		1125	581	1010	764	1106

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Main estimation results. Differences-in-differences estimates of prices.

Note: The dependent variable is the log of the composite price variable. Column (1) presents the DD results controlled for restaurant category, collection method and restaurant type, columns (2) to (4) present the DD results from the fixed-effects regression. Columns (1) to (3) compare Finnish and Estonian restaurant prices and column (4) compares changes in Finnish restaurant prices with hotel prices. Columns (5) and (6) compare Finnish composite restaurant meal prices with Swedish and Norwegian meal prices. The standard errors are calculated by using country or industry clusters with a block bootstrapping method.

The overall result is that weighting by restaurant size categories leads to larger price change estimates than without weights. This observation suggests that relatively larger restaurants reduced their prices more than smaller ones. The weighting increases all point estimates compared to the unweighted main result but they are still smaller than full pass-through (-7.4%). On average, the results suggest that the representative meal price decreased by slightly more than half of the full pass-though.

There are number of caveats with these weights, however. The turnover statistics also include other sales than restaurant meals as long as these sales are made within the same firm. In some cases there are really large corporations that have a range of activities from supermarket activities to gas station operations, as well as restaurant operations. We tackled this problem by reducing the weights especially for firms that were not classified as primar-

VARS	(1) Norm	(2) weight	(3) weight Hotel	(4) weight Swe	(5) weight Nor
DD	-0.022***	-0.033***	-0.059***	-0.024***	-0.042***
	(0.010)	(0.003)	(0.008)	(0.007)	(0.009)
N	2250	2250	2020	1270	3182
R^2	0.153	0.350	0.131	0.380	0.320
N of firms	1125	1144	1010	764	1663

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimation results weighted by turnover

Note: Fixed effects DD estimates where the dependent variable is the log of composite price variable. Column (1) presents the main result, columns (2) to (5) present the weighted estimation results, where the weights are firm turnover in 2010. Columns (1) and (2) compare changes in Finnish and Estonian restaurant prices, whereas column (3) compares changes in Finnish restaurant and hotel prices. Columns (5) and (6) compare Finnish composite restaurant meal prices with Swedish and Norwegian prices from CPI data. The heteroscedasticity-consistent standard errors are in parenthesis.

ily belonging to the restaurant sector. Still, the whole weighting process is somewhat ad hoc in nature, but nevertheless the best available. The weighted results should be regarded as indicative rather than precise estimates. We expect that these weighted results offer an upper bound for the actual price changes as the weighting could still be too high for large restaurants even after the corrections we make. We also have to be careful when interpreting the significance of the results as we present naive heteroscedasticity-consistent standard errors.

To shed more light on what drives the heterogeneity of the results, Tables 6 and 7 show the results where the effect of the reform, represented by the DD-variable, is interacted with the main categorical variables we collected in the price survey process. Column (1) in Table 6 presents the result where the DD variable is interacted by the type of restaurant. The omitted type is fast-food restaurants. The results indicate that there are no differences in pass-through whether the restaurant is fast-food, cafeteria or a la carte. But the results suggest that especially restaurants serving mostly lunches

reduced their prices the most. In column (2) the DD variable is interacted by whether the prices where collected from the internet or by phone. The price reduction is larger among restaurants for which we were able to find a website listing the prices.

VARS	(1) Classification	(2) Collect rule
DD	-0.014*	-0.025**
	(0.008)	(0.012)
A la carte	-0.007	
*DD	(0.005)	
Cafe	-0.007	
*DD	(0.009)	
Lunch	-0.020**	
*DD	(0.009)	
Phone		0.015**
*DD		(0.008)
N	2250	2250
R^2	0.171	0.163
N of firms	1125	1125
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 6: Estimation results divided by restaurant type and collection method
Note: Fixed effects DD estimates where the dependent variable is the log of the composite price variable. Column (1) presents the results where the DD variable is interacted with the 4-step restaurant classification and column (2) interacted with the price collection method (internet or phone). The standard errors are calculated by using country clusters with a block bootstrapping method.

Table 7 presents further divisions of the results. These are the same divisions we presented in Figures 6 and 7. It certainly holds here that if a restaurant belongs to chain or union, prices are cut more than in the rest of the sample. The results even suggest that most of the price responses come from these more 'organized' or 'unionized' restaurants, and among restaurants not belonging to these groups, the price response was very small if significantly different from zero at all, on average. This is the same conclusion we already

reached based on the graphical analysis.

VARS	Chain	MaRa
DD	-0.006	-0.012*
	(0.005)	(0.007)
Chain	-0.040**	
*dd	(0.017)	
MaRa		-0.029***
*dd		(0.012)
S-Group		
*dd		
N	2250	2250
R^2	0.279	0.215
N of firms	1125	1125
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 7: Estimation results divided by whether an establishment belongs to a chain or to MaRa

Note: Fixed effects DD estimates where the dependent variable is the log of composite price variable. Column (1) presents results where DD variable is interacted with whether restaurant belongs to a chain or not and column (2) whether restaurant belongs to MaRa or not. The standard errors are calculated by using country clusters with block bootstrapping method.

The results, thus far, show the responses on the log composite of three prices. However, this perhaps begs the question as to how dependent the results are on this categorization or how heterogeneous the price responses are across meal types. Figure 8 shows the average relative reduction in prices across the price categories in our price data. Prices fell by a similar amount in most price categories. The largest point estimate of price changes is for desserts. However, this is still not statistically different from any other meal prices affected by the VAT reduction. Wine and beer are in the control group, since their VAT remained at the standard rate. We also observe zero price effects for them. This is also a robustness check for our method.

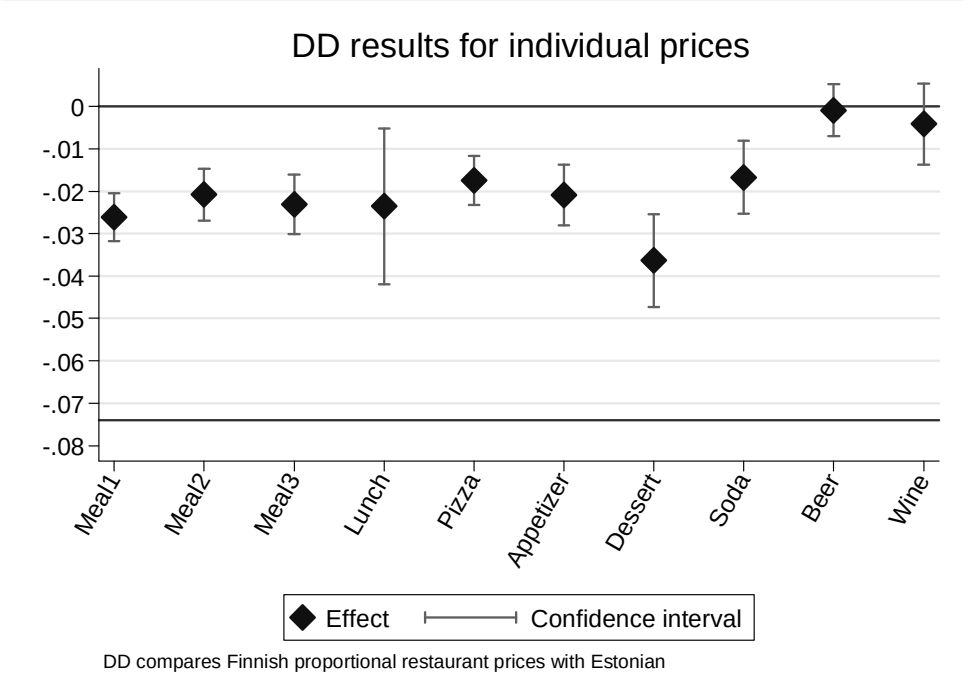

Figure 8: The restaurant-level results from fixed-effects regression by each price category and 95% confidence intervals

5.2 Demand effects

We start the analysis of demand effects by showing graphical evidence. Figure 9 describes the development of average monthly turnover in thousands of euros for the restaurant and hotel industries over time from January 2008 to December 2011. The solid line on the horizontal axis is the time of the VAT reform, July 2010, and the dashed lines are for every July in the following years. The figure shows that the overall trend over time is similar for these two industries, although on average it seems to be more pronounced for hotels. There seems to be a lot of variation in turnover during the calendar year. Consistently, July in each year has the highest turnover in both industries. However, the variation creates challenges for statistical analysis.

To reduce the variation and to identify the changes in turnover clearly, we compute a percentage change variable for each firm. It compares the monthly turnover with the turnover in the same firm 12 months previously.

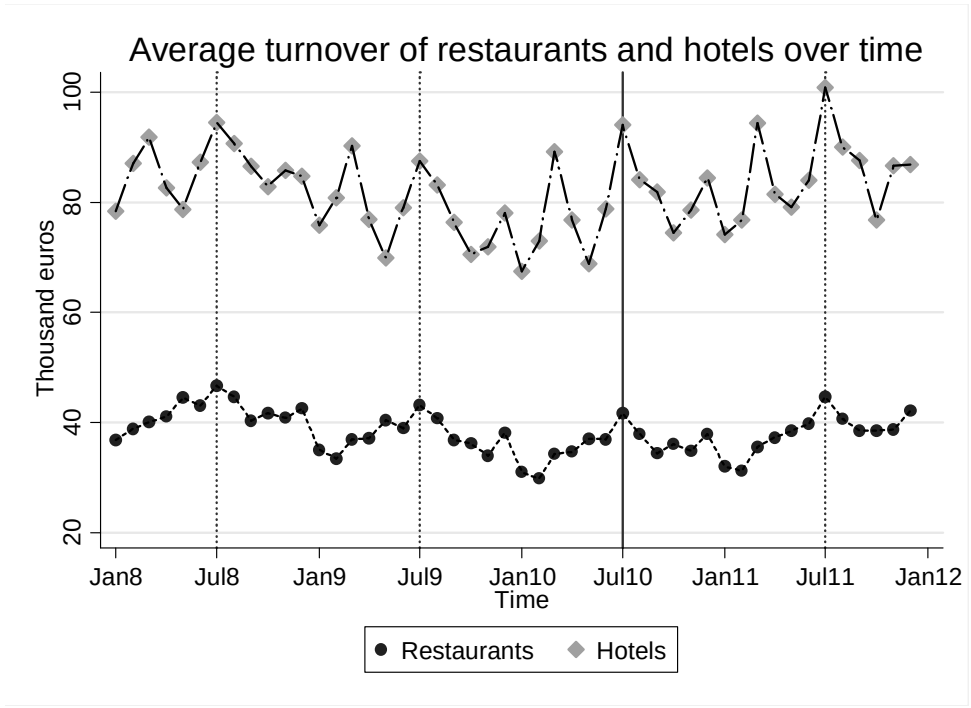

Figure 9: Average turnover over time for restaurants and hotels

As a formula the variable is:

$$S_{R,m} = \frac{1}{n^R} \sum_{i \epsilon R} \frac{s_{m,i} - s_{m-12,i}}{\bar{s}_{y-1,i}} \tag{5.1}$$

$$\triangle S_m = S_{R,m} - S_{H,m}$$

where i denotes the firm, R denotes the restaurant industry, H denotes hotels, m is the month, y is the year, n is the number of firms, $\bar{s}_{y-1,i}$ denotes the average monthly turnover of firm i in the previous year and $s_{m-12,i}$ refers to the turnover of firm i 12 months previously. We also compare the percentage changes in turnover between groups by taking the differences of the means of the groups, e.g. between restaurants and hotels, described by $\triangle S_m$. In addition, we apply this method to investigate the changes in wage sums as well in section 5.3.

We apply some necessary data restrictions. We examine only those restaurants where over half of the turnover comes from restaurant meals and those

hotels where at least a third of the turnover comes from hotel room sales. This is necessary as the industry classification is not exact enough to separate firms by the principal sales of the firms. First, the problem is that there are many restaurants and hotels with occasional operations only. The restaurant industry includes firms offering occasional catering services, bars and kiosks etc. Similarly, the hotel industry includes many motels which operate during the summer only and firms renting cottages occasionally. Second, there are some large firms with a restaurant or hotel industry classification but the turnover of these firms comes from operations other than selling meals or offering hotel services. Third, there are also firms coded in different industries than restaurants or hotels but where a large share of their turnover comes from sales of restaurant meals or hotel services. The method of examining changes in consumer prices presented in equation (5.1) also requires firms to have positive turnover over time. Thus we use this method to examine the intensive margin responses. The relevant data set used in the analysis is approximately half of the total number of the firms described in table 3. This data restriction is valid until section 5.4, where we investigate the extensive margin responses.

Figure 10 describes the weighted estimates[12] for $S_{R,m}$ and $S_{H,m}$ in the upper panel and the mean difference of these two $\triangle S_m$ in the lower panel over time. The interpretation of figure 10 is as follows: if the consumer prices and quantities sold change immediately after the reform and remain unchanged in the long run, the turnover changes would emerge in the first 12 months after the reform and there would be no changes after 12 months. This is because we compare monthly turnover with turnover 12 months previously for each firm. The horizontal axis is in months from the reform, and thus zero refers to July 2010, -12 is July 2009 and so on. The overall trends seem to be relatively similar between the groups before the reform although there are small differences just before the reform. Nevertheless, the figure shows that there is a decrease in the change in turnover right after the reform among restaurants relative to hotels.

We estimated 2% unweighted and 4% weighted pass-through to consumer prices. With no changes in the quantity of services sold, we should see a 2-4% drop in turnover for restaurants. If the quantities sold increase due to the reform, the change in turnover would be positive or at least closer to zero than the observed pass-through to prices. Figure 10 shows that turnover

[12]We use average turnover in 2009 for each firm to weight the estimates.

decreases after the reform among restaurants. This gives us initial evidence suggesting no increase in demand for restaurant meals due to the reform.

In addition, Figure 1 suggests that consumer prices in the Finnish restaurant industry catch up with prices in restaurants in neighboring countries soon after the reform. Figure 10 indicates a similar development in turnover. After the reform the change in turnover gradually increases and six months after the reform there is no difference in the changes in turnover between restaurants and hotels. This suggests that the increases in consumer prices affect strongly the turnover valued at consumer prices, which further implies that demand for restaurant meals is inelastic in respect of prices in the short run. However, the quantities of restaurant meals sold could also increase gradually over longer period of time, which then would increase turnover.

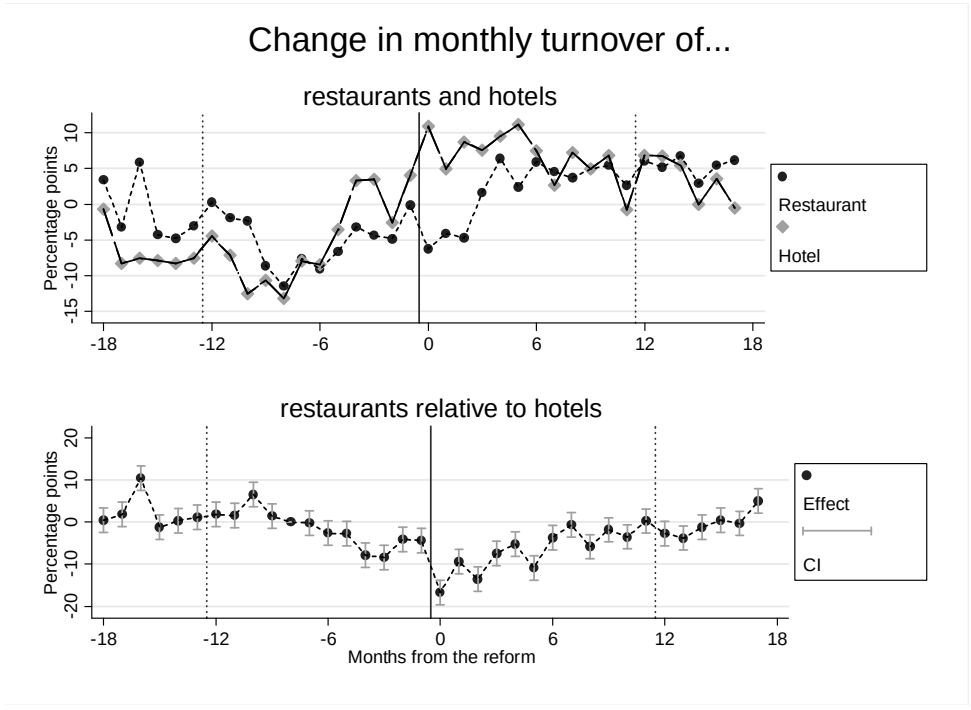

Figure 10: Changes in monthly turnover of restaurants and hotels over time

Nevertheless, there is a reason which could dampen the size of the effect. Turnover includes sales of products and services other than restaurant meals, as figure 3 previously described. For example, the VAT rate for alcohol and drinks sold in restaurants is different than that for meals, but these goods

are included in the total turnover. However, the data restrictions mentioned above diminish this problem. The changes in turnover should, however, be correct if the share of turnover coming from the other VAT bases is unchanged due to the reform.

An additional margin of response could be a change in tax evasion in the industry due to the reform. This is not directly observable in the data and we cannot investigate this channel of response precisely. However, we can discuss the possible effects of tax evasion with respect to our results. The benefits from tax evasion decline after the reform, which could end up reducing tax evasion. A reduction in tax evasion would increase reported turnover at the lower VAT rate and turnover would also increase in response.[13] This effect would go in the same direction as the demand response and vice versa. Thus our estimate would be a lower bound for the real estimate of reported turnover and quantity changes.

Next we show the change in turnover for firms in our price sample. We measure the change in turnover per quarter to reduce the seasonal variation in the data. Again we apply the method presented in equation (5.1). Figure 11 illustrates the change in turnover for restaurants by dividing the data according to their chain status. We split the data by chain status as chain restaurants reduced their prices more often than others (see Figure 6). Therefore, one would expect to observe growth in turnover especially for those restaurants if the quantities respond to price changes considerably. The horizontal axis presents quarters from the reform and the solid vertical line is for the time of the VAT cut. It seems that there is a downward sloping change in turnover right after the reform for chain restaurants. The change in turnover one quarter after the reform for chain restaurants seems also to be similar in size than the price pass-through was. This clearly suggests that the quantity of restaurant meals sold did not increase in response to the reform. Furthermore, these observations together imply that the demand for restaurant meals is rather inelastic.

In addition, we estimate the effect of the reform on turnover using a

[13]There might be some manipulation in reported VAT by firms due to the reform. Restaurants, for example, could report part of their sales at reduced VAT rate for which that rate is not applicable. We cannot observe how correctly firms apply the reporting rules in the data. However, this kind of report manipulation is illegal (tax evasion), and we think it is not a great problem for the analysis. Yet the effects on total turnover (turnover taxed at different VAT rates in total) that should provide a correct estimate if tax evasion behavior is not affected in total.

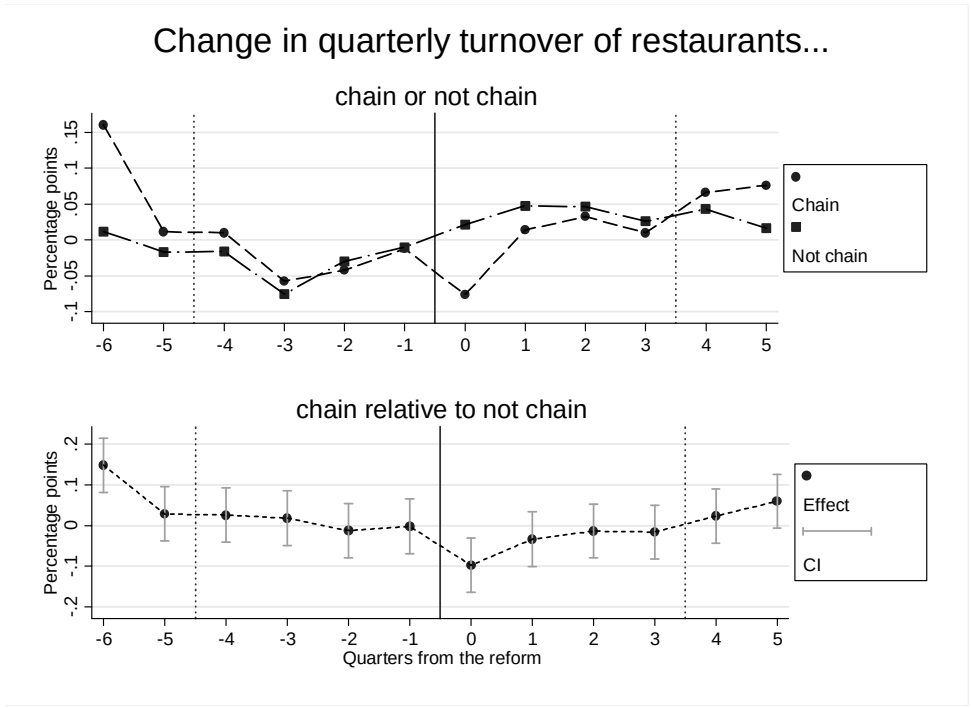

Figure 11: Change in quarterly turnover of restaurants: Competitive and not competitive

similar DD strategy as we did for prices. In these estimations we again collapse the data from months to quarters and use the data only one year before and one year after the reform to diminish the variation in the data. Thus these results can be interpreted as short-run effects on demand.

We compare the log of turnover between restaurants and hotels before and after the reform. The logarithmic outcome produces proportional changes and the fixed effect model controls for the history of each firm in a similar fashion as the graphical analysis presented above. The difference between the graphical analysis and the estimation strategy is that the comparison is now made with the previous quarter of the year, not with the year before.

Table 8 shows the results. The first part of Table 8, columns (1) and (2), is for all the restaurants and hotels in the data. Column (1) reports the DD result and column (2) interacts the DD variable with the MaRa dummy, MaRa being the union representing the restaurant and hotel industries. The second part of the table, columns (3) to (6), is only for firms for which we

have price data. Otherwise, columns (3) and (4) are constructed as columns (1) to (2). Column (5) distinguishes the effect on chain restaurants from other restaurants, column (6) separates the effect on restaurants that did reduce their prices by over 5% right after the reform from other restaurants.

Overall the results imply a decrease in turnover for restaurants after the reform. Column (1) shows that the turnover of restaurants decreased by 4.2% after the reform relative to hotels. In our price analysis we found a 4.4% decrease in consumer prices for restaurants when we compared them to hotels (see Table 4 column (4)). Thus the changes in turnover and consumer prices are very similar. This clearly suggests no increase in the quantity of restaurant meals sold in the restaurant industry due to the reform. In column (2) we interact the DD variable with a dummy of belonging to MaRa or not. It seems that the turnover of MaRa restaurants decreases less due to the reform than the average impact. However, the overall effect is still negative also for MaRa restaurants.

We also estimate the effects of the reform for the data for which we have price observations. Because of the small sample and large variation in turnover, we do not find any statistically significant results. Nevertheless the point estimates are what we should expect based on the graphical analysis above. They are mostly negative and in column (5), where we interact the chain dummy with the DD variable, it shows that turnover decreased the most among restaurants belonging to a chain. This is also true for those restaurants that reduced their consumer prices most right after the reform, in column (6). In general, it also seems that the estimates produced by using the sample for which we have prices (columns 3 and 4) are a bit larger than for the whole sample (columns 1 and 2), however, the difference is not statistically significant for any comparison.[14]

[14]The results survived a battery of robustness checks. For example, we performed placebo treatments a year before and a year after the actual reform and both of these produced zero results. This also suggests that the main assumption of the DD method, parallel time trends between groups, is satisfied. We also varied the time frame used from the base case of two years to one, three and four years. These changes do not affect the results for turnover much. In addition, we added yearly level control variables to the specifications but these did not change the results.

5.3 Employment effects

We analyse the employment effects by examining the changes in firms' monthly wage sums paid to their employees. If there are changes in the number of employees or in the salaries of existing employees, we should observe it with this variable. One of the EU's main reason for allowing reduced VAT rates for labor-intensive industries was to stimulate employment. Thus, from a policy point of view, it is highly relevant to study these effects.

We start again with graphical evidence. Figure 12 describes the changes in monthly wage sums similarly as we described in figure 11 for turnover. Therefore, the analysis is only on the intensive margin responses. The trends in the changes in these two figures are relatively similar before the reform. However, there is no clear change in restaurants' wage sums after the reform. This also seems to hold if we compare the changes in restaurants' wage sums to the corresponding trend in hotels' wage sums (lower panel of Figure 12). It even seems that the average change in wage sums for restaurants decreases slightly right after the reform. Therefore, based on the graphical evidence, we do not detect any clear changes, on average, in restaurant wage sums due to the reform.

We also estimate the effects of the reform on wage sums using the DD approach. We aggregate the data into quarters and use the log of wage sums as a dependent variable similarly as in the turnover estimations. Table 9 reports the results. The columns are organized exactly as in Table 8. There are no statistically significant changes in the wage sums of restaurants due to the reform. All the DD estimates are negative, suggesting that some of the restaurants even decreased their wage payments or the number of employees after the reform. However, none of these estimates are statistically significant. The negative point estimates suggest that restaurants did not increase their wage sums due to the reform. We also interacted the DD variable with the same set of categorical variables as for the turnover estimations. Restaurants belonging to MaRa or a chain, or restaurants which changed their price most, all have positive interaction coefficients. However, again, none are statistically significant. The zero result for wage sums seems to be a fair conclusion from these estimations. This gives more evidence supporting the inefficiency of VAT reductions for labor-intensive industries. This also supports the view that VAT reductions are not an efficient way to increase employment in the industry, which was the objective defined by the EU for

Figure 12: Change in monthly wage sums of restaurants and hotels

VAT cuts for labor-intensive industries.[15]

5.4 Entry and exit

An additional channel of response could be in extensive margin. This would be reflected in an increase in the entry of new restaurants in the industry and/or a decrease in the number of exits. The costs of entering the market decreased due to the reform, and this might have stimulated new businesses. In addition, the reform, of course, also decreased the costs of operating firms in the industry, and thus could have revitalized those businesses struggling in the restaurant sector, resulting in a decrease in exits. Thus, to provide a conclusive analysis, we study the number of new entries and exits by comparing hotels and restaurants over time. This is possible as we have the total

[15]Again, we checked the robustness of the results similarly as described in footnote 14 for turnover. The results survived these examinations well.

data for all restaurants and hotels in the industry which are obliged to register with the tax authority. In this section, we only emphasise the graphical evidence.

First, in Figure 13 we show how many entries and exits there are per quarter. It would seem natural for the number of entries and exits to be much higher in the restaurant than the hotel industry. The figure indicates that the number of entries roughly equals the number of exits in both industries, leaving the total number of firms unchanged. Both the number of entries and exits seems to be more pronounced in the first quarter of the year.

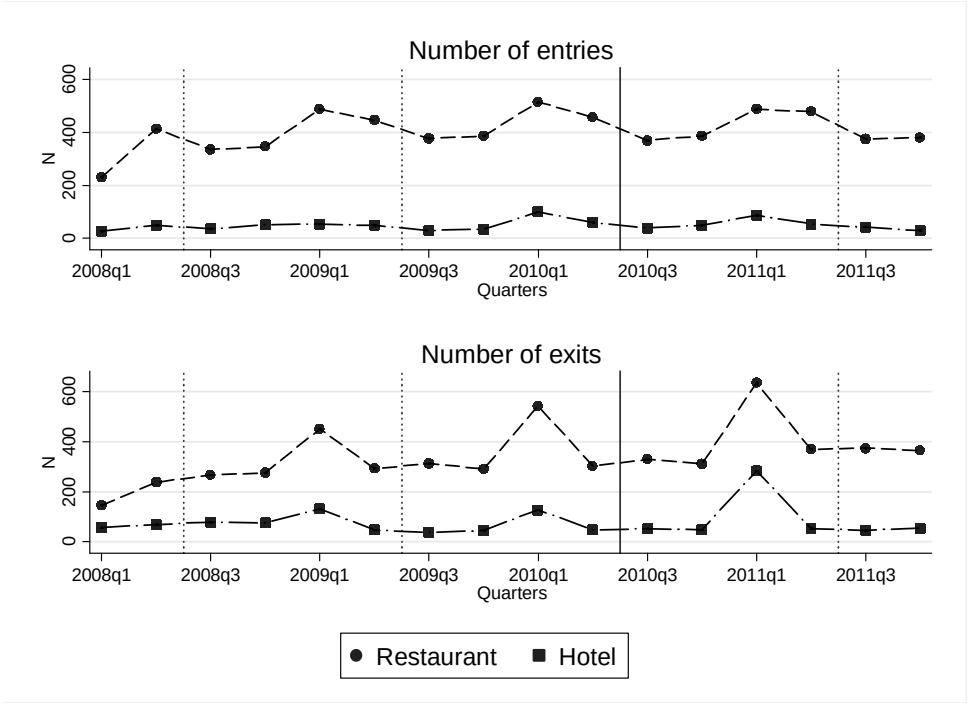

Figure 13: Number of entries and exits over time: Restaurants and hotels

To study the possible effects of the reform, we also plot the probabilities of exit and entry in Figure 14. Both the exit and entry probabilities seem to be relatively stable over time, although there are some exceptions from the overall trend, e.g. the spike of exits in the first quarter of 2011 among hotels (quarter 2 in the figure). Thus, until now we may be fairly sure in concluding that we do not observe any change in exits or entries due to the reform. However, we still estimate the DD model between restaurants and

hotels, and present the estimates and 95% confidence intervals in Figure 15. The estimation confirms our previous conclusion: we do not see any change in DD estimates, neither for entries nor exits after the reform. However, it is still possible to see some changes over a longer period of time, but, at least after 1.5 years, no evidence of change is observable.

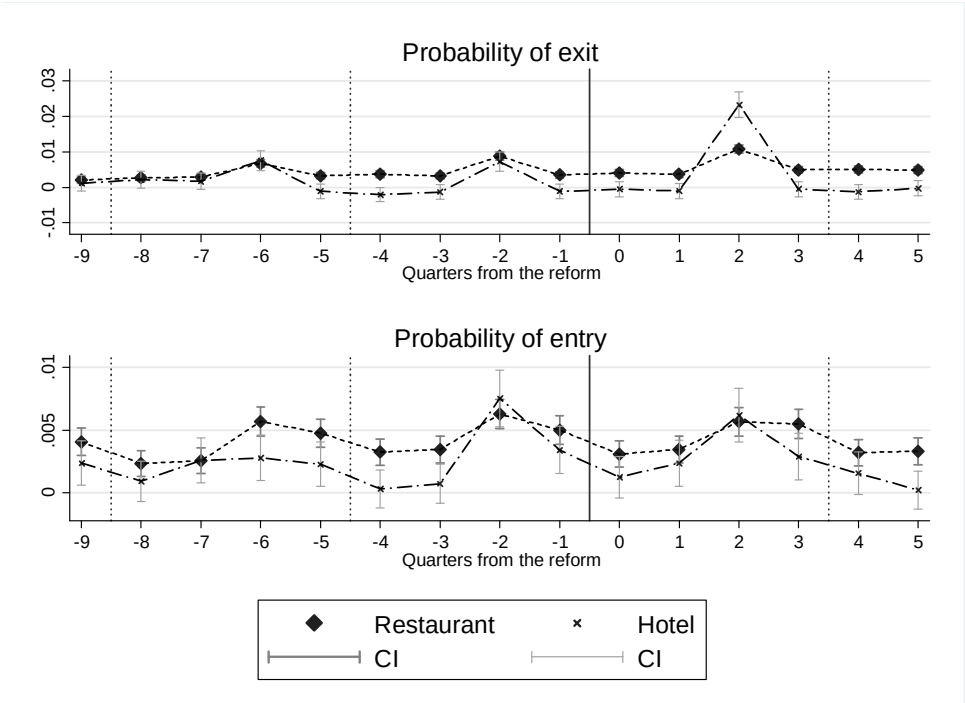

Figure 14: Exit and entry probabilities over time: hotels and restaurants

6 Conclusions

We examine the effects of a VAT cut on restaurant meal prices, demand and wage sums paid to employees in Finland. The VAT rate was reduced from 22% to 13% from the beginning of July 2010. The EU Member States were allowed to apply reduced VAT rates for restaurant services just one year before the Finnish reform (CD 2009/47/EC). Thus restaurants did not have much time to anticipate the change. We also think that policy endogeneity is not a substantial problem, since it was because of the EC Directive that the

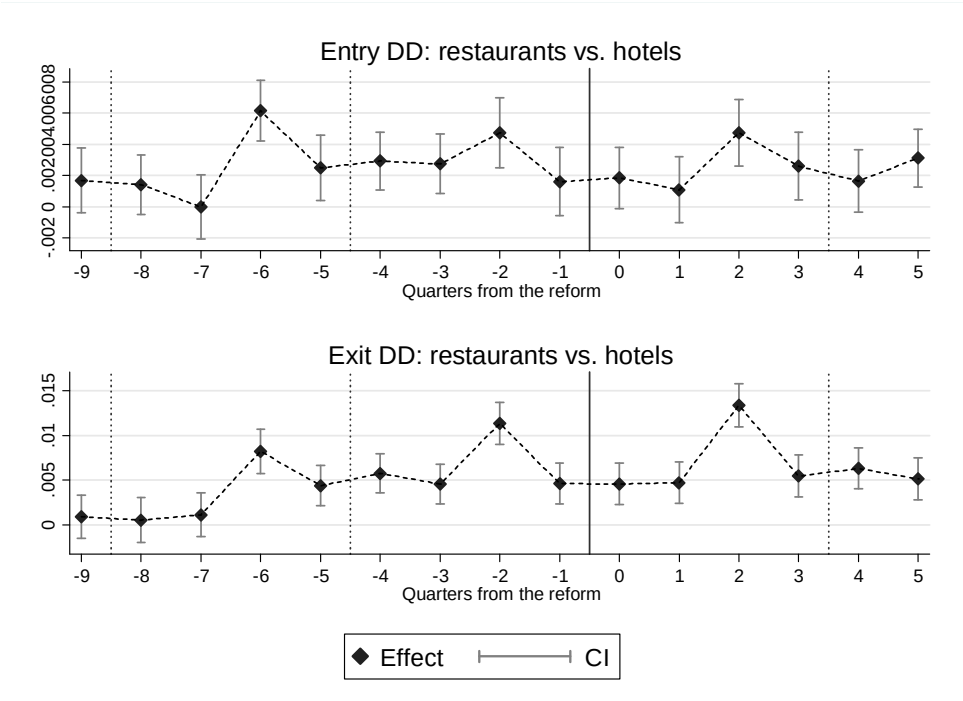

Figure 15: DD estimates for exit and entry over time: hotels vs. restaurants

Finnish government chose to apply reduced VAT to the restaurant industry rather than other similar industries. Therefore, we have an interesting opportunity to credibly estimate the effects of consumption taxes on different important margins of response.

We use an extensive amount of graphical evidence in the analysis. This is possible because we have unique firm-level price data and tax record data for monthly turnover and wage sums. With our price data, created especially for this study, we are able to show the whole distribution of price changes due to the reform. This is not common in the previous literature. In addition, we have an opportunity to estimate rarely available margin of response in the previous literature as we approximate the changes in quantities of restaurant meals sold after consumption tax reform. Using these information together we may draw a conclusion of the effectiveness of consumption taxes on this sector.

We make use of the standard difference-in-difference approach with fixed effects to estimate the average effect of the reform on consumer prices, de-

mand for restaurant meals and wage sums. Our main estimate implies that the VAT cut reduced restaurant meal prices on average by 2.2%. A full pass-through would have implied a 7.4% consumer price reduction. Thus, the price reduction is approximately a quarter of full pass-through to prices. The weighted change in prices was higher, 4%, over half of the full pass-through. The interpretation of the difference between the estimates is that, on average, larger firms reduced prices more than smaller firms. Also, there seem to be large differences in the price estimates, especially depending on whether or not the restaurant belongs to a chain or MaRa (the union representing restaurants and hotels). If a restaurant belongs to one (or both) of these categories, the price change was much larger than in our base-line estimates. Independent firms, not belonging to any union or chain, seem to have mostly ignored the reform as they did not change their prices at all in a result of the reform. We also found that lunch restaurants reduced their prices slightly more than other types of restaurants.

Our results for turnover and wage sums suggest no changes in demand for restaurant services or employment in the sector. We find that even those restaurants which did change their prices the most did not experience an increase in the number of restaurant meals sold. We also have graphical evidence supporting the view that turnover follows the development of consumer prices. In addition, we do not find any effects on entry into or exit out of the restaurant industry due to the reform.

These observations imply that the price elasticity of demand (quantities) is very small or even close to zero. Our estimates are in line with the paper by Kosonen (2010) studying the effect of a VAT cut on hairdressers in Finland. Thus we conclude that consumption tax reforms for labor-intensive industries, even when as large as in this case, are not very efficient policy means for increasing demand. Also, the job creation objective of reduced VAT rates for labor-intensive industries (CD 1999/85/EC) is evidently not fulfilled.

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Appendix

	All		Firms with price observations			
	(1)	(2)	(3)	(4)	(5)	(6)
VARS	All	MaRa	All	MaRa	Chain	Price change
DD	-0.042***	-0.048***	-0.005	-0.020	0.008	0.006
	(0.010)	(0.010)	(0.034)	(0.039)	(0.036)	(0.036)
MaRa*		0.025***		0.056		
DD		(0.010)		(0.035)		
Chain*					-0.051	
DD					(0.055)	
Price change >5%*						-0.063
DD						(0.054)
N	26,963	26,963	4,146	4,146	4,146	4,146
R^2	0.072	0.072	0.036	0.037	0.037	0.037
N of firms	3,402	3,402	543	543	543	543
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 8: DD estimation results: Turnover

Note: Fixed effects DD estimates where the dependent variable is the log of consumer price turnover. Columns (1) and (2) present the results for the whole data set of restaurants and hotels, and columns (3) to (6) present the results for those firms for which we have price data around the reform. Column (1) presents the DD results, column (2) presents the result where the DD variable is interacted with whether the restaurant belongs to MaRa or not, columns (3) and (4) contain the same estimates as in columns (1) and (2) but only for firms for which we have price data. In column (5) we interact the DD variable by a dummy for belonging to a chain or not, and in column (6) for whether or not a restaurant reduced prices by over 5% after the reform. The standard errors are calculated by using industry-level clusters with a block bootstrapping method.

	All		Firms with price observations			
	(1)	(2)	(3)	(4)	(5)	(6)
VARS	All	MaRa	All	MaRa	Chain	Price change
DD	-0.031	-0.042	-0.016	-0.032	-0.027	-0.051
	(0.035)	(0.037)	(0.048)	(0.061)	(0.055)	(0.058)
MaRa		0.029		0.037		
		(0.023)		(0.066)		
Chain					0.039	
					(0.065)	
Price change						0.143
						(0.094)
N	17,065	17,065	2,831	2,831	2,831	2,831
R^2	0.003	0.003	0.007	0.007	0.007	0.009
N of firms	2,563	2,563	440	440	440	440
Standard errors in parenthesis						
*** p<0.01, ** p<0.05, * p<0.1						

Table 9: DD estimation results: Wage sums

Note: Fixed effects DD estimates where the dependent variable is the log of wage sums. Columns (1) and (2) present the results for the whole data set of restaurants and hotels, and columns (3) to (6) present the results for those firms for which we have price data around the reform. Column (1) presents the DD results, column (2) presents the result where the DD variable is interacted with whether a restaurant belongs to MaRa or not, columns (3) and (4) contain the same estimates as columns (1) and (2) but only for firms for which we have price data. In column (5) we interact the DD variable with a dummy for belonging to a chain or not, and in column (6) for whether or not a restaurant reduced prices by over 5% after the reform. The standard errors are calculated by using industry-level clusters with a block bootstrapping method.

Table A1: Desciptive statistics for CPI data from the statistics offices of Sweden and Norway (in euros)

Sweden			Norway		
Variable	Mean	N	Variable	Mean	N
Dinner1	42.41	84	Beef	8.95	36
Dinner2	32.28	63	Salmon	21.74	138
Dinner3	24.37	93	Salad	14.58	165
LunchA	9.70	115	Pizza	15.06	144
LunchB	10.34	59	Sandwich	5.97	202
Lunch Fish	14.26	49	Soup	11.15	92
Wine	29.31	117	Wine	8.91	310
Beer	6.32	117	Beer	8.05	220

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ISBN 978-952-274-094-6 (PDF)
ISSN 1798-0291 (PDF)